

WATERLINES

ISSUE 1, 2023



resilient and adaptive solutions



STEVE CLARK
Managing Director



Welcome to our latest issue of Waterlines

In this edition of Waterlines we take a moment to reflect on the year of 2022 and the flooding disasters that were relentless. It is hard to believe that we have recently passed the one year anniversary of some of the most devastating floods experienced on the East Coast.

Disaster recovery does take time and we acknowledge the continuing impact for those affected and who are very much still recovering and rebuilding homes, businesses and community.

It's heartening to see significant support being channelled to those impacted, and in particular the focus on mental wellbeing. Many of these communities have suffered multiple disasters on top of a health pandemic.

We are proud to be supporting the flood recovery efforts in many ways and we will share more about that in the next edition of Waterlines.

The degree of flooding experienced in 2022 has brought the topic of climate change to the forefront. We have a team of professionals passionate about our environment and are working in areas of resilience and adaptation to climate change impacts across urban, rural and coastal settings. Our coastal teams have been involved in some great work using natural methods to protect our dunes. Workshops with our passionate communities have been a highlight.

I invite you to read about the broad range of projects that we have been working on across Australia. A new feature of our Waterlines newsletter is our "Out and About" section, as our team are always up to something and we would like to share with you some of those moments as well!

Please do not hesitate to contact me or any of the Water Technology team at any stage if we can be of assistance.

"We have a team of professionals passionate about our environment, and are working in areas of resilience and adaptation to climate change impacts across urban, rural and coastal settings."

A year that was

FLOODING THAT IMPACTED ALL OF AUSTRALIA

2022 will be known as the year Australia experienced unprecedented and record breaking levels of rainfall and subsequent flooding, with many locations experiencing multiple flooding events. The Aussie spirit was tested, with all of Australia experiencing flooding in one way or another.

Not all flooding is the same and many factors play a part in how and why flooding occurs in a certain location. No matter what the why or the how is, the impact is pretty much always the same: psychological distress, physical infrastructure damage, loss of business income, significant disruption and in the worst cases there is loss of life.

Here is a recap of how the floods unfolded in 2022 and the role that Water Technology played (and continues to play) in supporting the flood relief effort.

January 2022

The year commenced with a flood in the outback of South Australia. An extreme weather event caused more than 200 mm of rain in some areas; half the average rainfall for an entire year. The Alberga River flooded which caused the isolation of towns and damage to parts of key rail and road networks. Trucks were forced to take a 3000 km detour from Adelaide distribution centres.

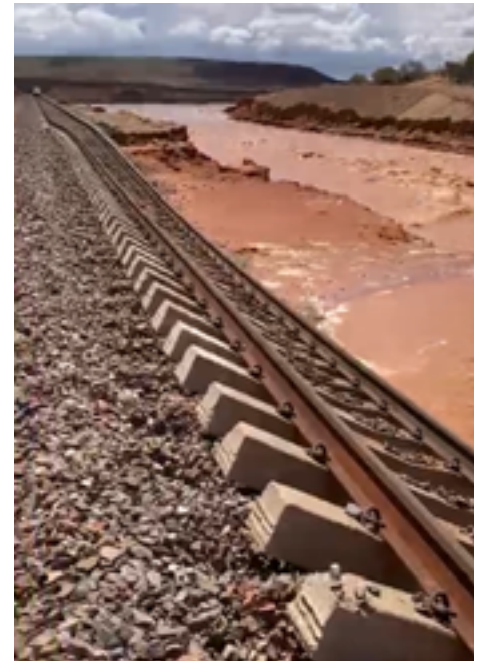
February - April 2022

The next flood emergency commenced in South East Queensland in February 2022. Several climate drivers brought extreme multi-day rainfall, causing significant flooding from 22 February to 7 March. Highly localised storms resulted in intense rain and extensive flash flooding along creeks and tributaries of the major rivers. Tragically, 13 people lost their lives during this event and more than 9,000 homes and businesses were damaged. Schools were closed, evacuations took place, and there was a supply chain crisis.

Catastrophic flooding then occurred in New South Wales, less than a

year after their previous significant flooding event of March 2021. A summer of higher than average rainfall due to La Niña had already saturated the catchment and floodplains of many regions. The sustained heavy rainfall events across NSW in February, March and April, increased the severity of the flood events. Each successive storm intensified the impact of the previous storms.

The heavy rainfall in some locations was of an intensity, frequency and duration never seen in the observed record. The multi-day and multi-week nature of the intense rainfall had the greatest impacts.



Tarcoola to Pt Augusta Railway
January 2022
Source: ARTC

The floods inundated major towns and regional areas. For example, along the Wilsons River, there was devastating flooding of the town of Lismore on 28 February and then a second major flood on 30 March where major flood river heights were exceeded by almost 5 m.

In mid-March there was flash flooding at Broken Hill and on 1 April in Byron Shire.

Between 22 February and 8 April the NSW SES received in the order of 30,000 requests for assistance and conducted approximately 2,200 flood rescues.



July 2022

The heavy rainfall came again in early July over a NSW coastal region from approximately the Hunter to Jervis Bay and inland including the Blue Mountains. Parts of Greater Sydney, including the Hawkesbury-Nepean valley but also the Hunter and Illawarra, flooded in July 2022, with some areas exceeding March 2022 flood peaks. On 2 July, the town of Camden in NSW was ordered to evacuate for the fourth time of the year due to more major flooding. A natural disaster was declared for 37 affected Local Government Areas. From 27 June to 12 July, the NSW SES received more than 9,000 requests for assistance and conducted in the order of 450 flood rescues.

October - November 2022

In October 2022, a low-pressure system travelled east over Australia, bringing heavy rainfall and storms across Victoria, and was the wettest

month on record for Victoria. Already high rivers, creeks, and saturated catchments had little capacity to absorb the rain, which led to one of the most devastating flooding events in Victoria's history.

Entire towns and neighbourhoods were evacuated, isolated or inundated with floodwater. The Victorian SES responded to more than 16,000 requests for assistance during October and November, including 900 flood rescues. Evacuations took place in Melbourne suburbs near the Maribyrnong River, and for northern Victorian communities along the Campaspe, Goulburn and Murray Rivers including the towns of Shepparton, Rochester and Echuca. Communities lost homes, businesses, infrastructure, roads and crops. No property in the town of Rochester was spared by the flooding.

At the same time, during mid October, Tasmania also experienced flooding. On 13-14 October 2022, the Great Lakes region (North-West and Northern Tasmania) registered 398 mm of rain in 30 hours. This exceptionally heavy rainfall caused severe flooding in some communities. Almost 100 properties were damaged by flooding. Catchments became extremely saturated and dams filled up. Even modest rain falls after that resulted in river rises and flash flooding.

December 2022

While many of the floods throughout the year were a result of extreme rainfall events with the outcome of flash flooding, the year came to a close with a slow moving disaster in South Australia. The flood waters from Queensland, New South Wales and Victoria all flowed gradually, eventually finding its way into the River Murray.

Peak flows reached the Victorian / South Australian border on the 22 December at a rate of 220 GL/d, at a time of year when the flow is usually around 20 GL/d.

The rising waters inundated 4,000 homes and businesses, forcing people to evacuate, bridges to close and ferries to stop operating.

Christmas and New Year celebrations were also impacted in the northern areas of Northern Territory and Western Australia, as ex-Tropical Cyclone Ellie resulted in extreme conditions and floods.

The deluges caused the Victoria River and the Fitzroy River to swell to record-high levels, inundating floodplains and isolating communities. Some communities were cut off by road and air for at least 10 days.

Conclusion

The floods across Australia in 2022 have been a human tragedy affecting so many. We have also seen the continued impacts of floods with the devastation in New Zealand. There is also the compounding effect of successive disasters, with little

time for recovery between each. The catastrophic flood events have prompted discussions about the need for a renewed and strengthened emphasis on sustained disaster preparedness to help communities be prepared for and resilient to flood and other natural disasters. Preparedness not only within the bounds of what is known, but also – as best possible – what is unknown. Building intergenerational knowledge in communities affected by natural disasters has also been highlighted as being essential.

Water Technology staff have supported our clients and communities around the country in varying capacities during and after the flood events of 2022. This involvement has ranged from informal support to authorities in areas where we have particular experience, formal secondments to Incident Control Centres to provide "flood intelligence" in support of emergency response operations, provision of advice regarding flooding mechanisms to insurers, review of the impact of the 2022 flood events and assessment of the implications for future planning

and emergency response.

Seeing people being flooded, and the impact of that has been confronting for many of our employees. At the same time, the resilience of the people across Australia has been humbling. We are aware (and support) the enormous amount of volunteer work undertaken by our staff following the 2022 flood experience. Finally, Water Technology are now actively involved in managed retreat projects in Lismore and other locations, following on from the experience in Grantham, Queensland in 2011.

The recovery and reconstruction of so many communities across Australia will continue for a long time.

With the tragedy and hardship, also comes expected profound benefits for our ecosystem. Inundation of wetlands, the scouring of the Murray mouth and the flow of water into the Coorong, to name a few, are essential for so many of our flora and fauna species.





Coastal Management

Championing nature-based solutions for our dune systems

Dunes are an integral part of our coastal environment, having many important functions including supporting valuable communities of plants and animals.

Appropriate protection and management of our dune systems will play a critical role in ensuring resilience to vulnerable coastal communities, both now and into the future. Especially in the context of rising sea levels and increasing frequency and severity of storm events due to human induced climate change.

The vulnerability of our coastlines has been demonstrated recently, with some locations along the New South Wales coastline being impacted by severe erosion due to a series of large storm events.

Such levels of erosion have not been seen since the last prolonged erosion phases of the 1970s and 1990s. This has led to a renewed focus on how coastal erosion is managed.

Historically, the protection of foreshore assets from coastal erosion along the New South Wales coastline has relied heavily upon structural solutions.

The construction of seawalls, groynes, and breakwaters can be highly effective. However, these solutions can significantly interfere with natural coastal processes if not appropriately designed and they also have a high capital cost and associated ongoing maintenance costs.

Water Technology has been championing the use of “nature-based solutions” as an alternative approach for the management of our coastal dune systems.

We know that coastal dune systems that include a diverse spread of native vegetation can provide significant protection for coastal communities through the 3 stages of the coastal erosion cycle:

- 1. Before storm events:** Well-vegetated dune systems can naturally accumulate sand over time, providing natural growth of sand buffers during periods of calmer weather
- 2. During storm events:** Dunes provide a protective, sacrificial sand barrier during storms. Furthermore, dense and well-managed dune vegetation can also minimise coastal inundation and erosion by binding the dune together with deep, sprawling root systems
- 3. After storm events:** Dune vegetation significantly aids in the natural recovery of beaches after storm events, by re-trapping and accumulating sand ahead of the next event.

However, the ability of a local dune system to serve this vital function is often hampered by the presence of weeds and non-native vegetation (that is not properly adapted to hard



"If you look after your dunes, the dunes will look after you"

coastal settings) and human use impacts such as uncontrolled pedestrian and vehicle traffic.

Water Technology's ongoing work on the Shoalhaven Coastal Management Program in New South Wales and Hinchinbrook Shoreline Erosion Management Plan in Queensland, has a strong focus on dune management and maintenance.

This work has included the design of location specific dune rehabilitation and restoration programs for our local government clients, incorporating:

- Planting of native dune vegetation species that are well adapted to harsh coastal conditions
- Design of formalised access tracks and low key dune fencing to reduce the impacts of pedestrians and vehicles on dune vegetation

Water Technology has also delivered a range of community information sessions, explaining the importance of dune care and how the community can play a vital role in helping to protect these vital systems.

When engaging with local communities, our team noticed how much people really do love and care for their local dune systems, too.

The outcomes of this work will provide tangible benefits to coastal communities through enhanced resilience and improved environmental outcomes. The old adage is true: "If you look after your dunes, the dunes will look after you."



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Landscape Restoration & Resilience

Incorporating Indigenous Knowledge & land management practices

First Nations communities have a long history of observation and interaction with the natural environment, leading to the development of collective skills, deep understanding and philosophies about land management practices. The recognition and application of this knowledge is significant within First Nations cultures and also plays an important role in sustainable natural resource management and restoration under conditions of rapid and sustained environmental change.

The Queensland Water Modelling Network, of the Department of Environment and Science, supported a project to improve understanding of how Indigenous Knowledge and First Nations Land Management Practices could be incorporated into technical projects for landscape rehabilitation and landscape resilience outcomes.

Over the last 12 months, a collaborative and innovative piece of work has been undertaken between Relative Creative, Aunty Kay Blades (Mandandanji Traditional Owner and project advisor), Firesticks Alliance and Water Technology and has included consultation with Queensland Murray-Darling Catchments Ltd Aboriginal Rangers.

The first phases of the work involved research, listening and exploration to identify how First Nations land management practices are currently used or engaged for technical applications.

The identified gaps and learnings highlighted several opportunities that were explored further in the trial phase of the project, centred around the cultural and environmental concerns at an inland wetland located on the lands of the Mandandanji people, in St. George.

Barriers for meaningful engagement with First Nations Knowledge holders were found to include:

- Client scope, budgets and timeframes not enabling meaningful (if any) engagement with First Nations Knowledge holders;
- A lack of established relationships with First Nations Knowledge holders, even if meaningful engagement is supported by a project;
- Engagement is limited to 'inform/consult' rather than 'collaborate/empower' (IAP2 spectrum), which can lead to consultation fatigue;
- Projects are compartmentalised, with scope to only complete one technical aspect of the overall project; and
- Engagement with First Nations Knowledge holders can be limited to the subject matter of Cultural Heritage, rather than Cultural Knowledge of land management practices.





These barriers were tested with 20 industry representatives during a project showcase at the Queensland Water Modelling Network Forum in October 2022.

Initial recommendations from this work are:

- Early consideration should be given to how First Nations inputs could be sought to enhance overall project outcomes in initial project design; and
- Collaboration with First Nations Knowledge holders should occur throughout all stages of a project to incorporate valuable perspectives and knowledge, focus on implementation and action on the ground and project contributors need to be fairly remunerated.

The outcomes of this work are based on the engagement conducted on the lands and waters of the Mandandanji people, and we acknowledge the wisdom, knowledge and connection to Country that we strive to learn from.

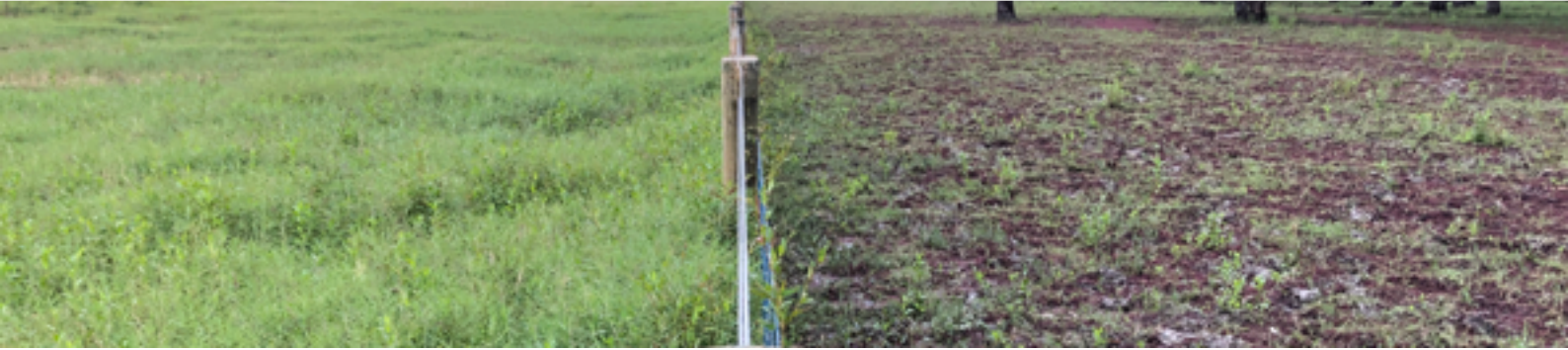
Aunty Kay Blades. Source: Relative Creative

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Barmah Forest Wetlands

Supporting the restoration of this Ramsar listed site



Barmah National Park is a Ramsar wetland of international significance, located on the Murray River floodplain in northern Victoria on Yorta Yorta Country. The area features a variety of permanent and temporary wetlands. The majority of the forest functions as a single floodplain system and is dependent on seasonal flooding. Comprehensive soil testing and water quality logging are ongoing as part of a monitoring program.

The area once supported numerous native aquatic grassland species which have significant biodiversity value in the Murray-Darling Basin. These aquatic grasslands provide important ecosystem functions including the annual turnover of nutrients and preventing soil loss and weed incursion into the system. In addition, they provide habitat and food for a range of fauna.

A legacy of feral grazing (by cattle, horses, pigs and deer), combined with adverse impacts due to river regulation, has seen the extent of the native aquatic grasslands face rapid decline.

For example, Moira Grass (*Pseudoraphis spinescens*) plains in Barmah have declined by over 95%, from an estimated 4000 Ha in 1930 to less than 300 Ha in 2019.

These conditions can also favour invasion by other native species including Giant Rush (*Juncus ingens*) and River Red Gums (*Eucalyptus camaldulensis*).



Water Technology has worked with the Goulburn Broken Catchment Management Authority and Parks Victoria on numerous projects that form part of their long-term strategy to restore the extent of aquatic grassland species across the Ramsar Site.

Extensive field studies have been undertaken including mapping of the distribution and cover of threatened wetland-dependent species, trialling propagation methods of Moira Grass and monitoring vegetation responses within and outside feral grazing enclosure fenced areas.

Many learnings were obtained from these trials including:

- Threatened native grass species can recover in less than two years if feral animal grazing pressure is removed
- Moira Grass propagation can be successful if two node cuttings are used, the conditions following planting are favourable, and if feral grazing pressure is removed
- Some species such as Water Primrose and Upright Watermilfoil may not be as susceptible to grazing as Moira Grass and Common Spike-sedge

The removal of feral grazing animals is fundamental to the recovery of treeless grassy wetlands within the Barmah Forest Ramsar Site. In the absence of feral grazing, Moira Grass can recover rapidly and, given favourable climatic conditions, field propagation can be undertaken to re-establish the grass where absent.

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Groundwater Extraction

Checking the impact in the Murray Mallee

When Murray Zircon was looking to recommence mining operations 150 km east of Adelaide in the Murray Mallee Region of South Australia, Water Technology provided the technical expertise to undertake a groundwater impact assessment.

A field investigation program was designed and delivered including the installation of two test production wells and four monitoring wells completed in the Murray Group Limestone aquifer. These wells were used to undertake pump tests, from which information about the aquifer could be obtained.

A hydrogeological conceptual model of the project area was then developed using data from the field investigation program, state databases and data collected during previous mining operations at this location. This conceptual model was then used to develop a numerical groundwater flow model of the project area.

The model has been used to assess the impacts of groundwater extraction from the Mercunda wellfield and to assess seepage from the in-pit tailings storage facility cells to the Murray Group Limestone aquifer.

Undertaking a groundwater impact assessment is an important process to ensure that groundwater extraction for supply purposes is sustainable and will not have an impact on other groundwater users in the vicinity.



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Riverlea Housing Development

Providing flooding and stormwater management expertise

A new urban area, 40 km north of Adelaide, has been in the planning phase since 2003 when it was declared a major development. The 1,320 Ha site is expected to contain 12,000 housing lots which will become home to 30,000 people, supported by a new town centre, shopping and commercial facilities. The Riverlea development will also include 400 Ha of open space and 40 Ha of waterways.

The site has some challenging features, as the northern boundary of Buckland Park is the Gawler River, and the western side is Gulf St Vincent. The adjacent Buckland Park Lake is also a vital refuge for waterbirds and the Dry Creek Salt Fields is a site of national and international significance for migratory shore birds.

The Gawler River is an important river system and forms at the junction of the North and South Para rivers just to the west of the Gawler township, and flows west before discharging into Gulf St Vincent

in the Port Gawler Conservation Park. Following significant flooding in 2016, the Gawler River has been the focus of a range of flood mitigation works, coordinated by the Gawler River Floodplain Management Authority.

Considering the scale of the development and its sensitive location, the developers engaged Water Technology to provide a range of services including:

- Development of flood and stormwater management options, including concept designs of appropriate flood detention;
- Water balance assessments for the adjacent lake systems and wetlands; and
- A risk assessment of the adjacent Buckland Park Lake and the Dry Creek Salt Fields.

Works are progressing on site and land is for sale. We look forward to seeing how the development comes to life.



Riverlea Development, March 2023. Source: Walker Corporation

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Out & About

What have our Techers been up to?



Tony McAlister (above, centre), Director and Queensland Regional Manager, hosted the first site inspection of the Southern Redland Bay wastewater treatment plant mangrove offset site in February 2023. Construction of the 'new' 10 Ha mangrove and saltmarsh system will commence soon. Following that, system performance will be studied for the next 4-5 years by the Griffith University led Australian Research Council (ARC) Linkage team. As the mangrove establishes and matures it will progressively receive more recycled water inflows. The ARC Linkage team comprises representatives from Griffith University, Lendlease, Water Technology, Redland City Council and the Queensland Department of Environment and Science.



Warwick Bishop, Director and Innovation lead, went to Warrnambool for a site visit in March 2023. He decided to take the train and his bike, rather than drive, resulting in a mobile office for most of the trip. Warwick then rode the 15km out and back to the site along the coast. Efficiency, wellbeing and sustainability in one! A great example of thinking about things differently on our journey to a more sustainable future.



Jamie Simmonds (above, left), Principal Consultant in Queensland, has been providing our neighbours in New Zealand support and information as they deal with the recent devastating flooding events in the North Island.

Jamie has spoken with Radio New Zealand's Checkpoint program ([Radio New Zealand](#)), NewstalkZB's Sunday session radio program ([newstalkzb](#)) and TV3 New Zealand's AM Program ([TV3](#)) about his experience of community relocation and managed retreat in Queensland.

Click on the links if you would like to watch or listen to the interviews.



Celine Marchenay (above, centre), Group Manager of our Integrated Stormwater Management Team and Principal Engineer in Victoria, took to the beach with team mates for Clean Up Australia Day in March 2023. They collected rubbish from a 3 km stretch of beach from Safety Beach to Dromana. The team enjoyed spending quality time together out of the office while doing something fantastic for the environment.

Celebrating our Values

Water Technology staff are invited to nominate team mates each month for the Top Techer awards. Nominations are aligned to the company values and a quick and easy submission process is in place. The nominations are reviewed at the end of the month by the Top Techer Committee and one winner is awarded. At the end of the year, all of the nominations received are reviewed and our annual winners are selected. We were very fortunate to gather together as a company in Brisbane in November 2022. A significant part of this gathering was our Top Techer 2022 awards celebration. The results are summarised here. Celebrating and rewarding our passionate and dedicated staff is a key thing that we love to do at Water Technology.

Achievement Vitaly Leschen

Described by team mates as a “technical wizard”, Vitaly achieved great things in 2022 while at the same time supporting many teams with dedication and reliability.



Integrity

Travis
Malmsheimer

Travis was recognised for his great attitude, skills and support while helping out on a challenging project.



Collaboration

Irene Zagas

Described as a colleague who is like a drummer in a band, keeping the beat of the business going, Irene was recognised for always being willing to dive in and 'get it done'.



Accountability

Jim
Hopkinson

Jim was recognised by his colleagues (and clients) for his dedication and commitment to an extensive field program and knowledge sharing approach.



Top Techers 2022

Balance

Ramanan
Baheerathan

Raman demonstrated great work life balance in 2022 while working remotely.



Knowledge

Bertrand
Salmi

Bertrand was recognised for going the extra mile to involve others in different teams to enhance the outcome and maximise internal opportunities for colleagues.



Innovation

Daniel Trnovsky

Daniel helped to develop innovative ways of handling modelling and processing limitations.



Spirit of Water
Technology

William
Prentice

A Top Techer committee determined award to acknowledge Will and all that he does for Water Technology and the team.



Excellence in
Leadership

Celine
Marchenay

A special award determined by the MD for great leadership shown throughout 2022.



Staff Profile

improving outcomes for communities



Filippo Dall'Osso
Principal Scientist

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Filippo is Group Manager of the Natural Hazards Team based in Sydney. With the Molino Stewart merger, he has recently joined Water Technology. Filippo had been working at Molino Stewart since 2016.

Following the completion of his PhD in coastal hazards and remote sensing, Filippo moved to Australia from Italy, starting his career as a researcher in coastal flooding at the University of New South Wales and then the University of Sydney.

Filippo brings to the team a breadth of expertise in floodplain risk management, coastal hazards management, emergency planning and multi-hazard risk assessment.

He has complementary skills in leadership, project development and implementation, mentoring and coaching, and collaboration; supported by his Italian flair and sense of humour.

Filippo loves to make a difference through his work. Knowing that his work will help to improve outcomes for communities provides him with great satisfaction.

When Filippo is not at work or with his family, you will either find him on a basketball court with other Dad's, listening to something from his extensive vinyl collection, or exploring the national parks around Sydney on his motorbike.

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